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Stochastic ion channel gating in the auditory nerve: models and implications

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Abstract

Fluctuations in the spike-initiation threshold of auditory nerve fibers are caused by stochastic gating of ion channels in the nodes of Ranvier. While there is growing evidence of these fluctuations for normal acoustic stimulation of the ear, they are most apparent in the case of electrical stimulation by a cochlear implant where synaptic input from the cochlea (and hence synaptic noise) is absent. In this talk I will describe a modeling study that gives further insight into how the stochastic gating of ion channels produces threshold fluctuations for electrical stimulation by a cochlear implant. Different mathematical approaches to modeling stochastic ion channel gating will be examined and their advantages and disadvantages discussed